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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/759,179	01/12/2001	Martin Hillebrand Blees	NL 000044	9984

24738 7590 06/22/2005

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EXAMINER

KACKAR, RAM N

ART UNIT

PAPER NUMBER

1763

DATE MAILED: 06/22/2005

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/759,179

Filing Date: January 12, 2001

Appellant(s): BLEES, MARTIN HILLEBRAND

Robert J. Crawford
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 4/4/2005

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of invention contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the issues in the brief is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

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US 5817242	Biebuyck et al	10-1998
US 5201987	Hawkins et al	4-1993
US 5937758	Maracas et al	8-1999
US 6245412	Choquette et al	6-2001

Whitesides et al "Soft Lithography" Angew. Chem. Int. ED. 1998, Vol 37 pp 551-575

(9) *Grounds of Rejection*

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitesides et al (US 5900160) in view of Biebuyck et al (US 5817242) as evidenced by Hawkins et al (US 5201987).

Whitesides et al disclose a stamp (Fig 3a) for use in a lithographic process, comprising a body (3a), a printing face (26), recesses with apertures (24), the recesses becoming narrower as the distance from printing face increases (3a) and projection of the recesses lying within the apertures (3a), the recess having a triangular shape (Fig 10 and Col 15 lines 39-49).

Whitesides et al do not expressly disclose recesses of different apertures and or different depths, especially third recess having an aperture at least five times the aperture of the first recess and a greater depth. However, in the real world applications the recesses would be of different sizes, in order to pattern features of different sizes.

Further, Whitesides et al do not disclose the Young's Modulus of the stamp body.

Biebuyck et al (Fig 2D) disclose a stamp with different sized apertures and disclose a composite stamp with deformable or elastic layer of a material having Young's modulus to be 10^4 - 10^7 dynes/cm² ($1 \text{ N/m}^2 = 10 \text{ dynes/cm}^2$) and another layer of different material. Biebuyck et al further teach that both the materials could be independently optimized and the other layer (patterned layer) could have Young's modulus greater than 10^6 dynes/cm² (Col 1 line 62- Col 2 line 33).

Whitesides et al teach that the aspect ratios should be between 0.2 and 2. This means that in general with a greater recess the depth would also be proportionally greater. This is further evidenced by the method of making stamp where a larger area exposed to anisotropic etch would produce a recess with greater depth. This fact is disclosed by Hawkins et al who teach (Fig 6 and Col 5 lines 19-23) that in a single isotropic etch varying depths will be obtained for different size of vias.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have a stamp with varying number of recesses and varying recess apertures depending upon the features needed. If that includes three recesses with third recess aperture more than five times or more than 20 times the aperture of the first recess the stamp would obviously need to have it.

3. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Whitesides et al (US 5900160) in view of Biebuyck et al (US 5817242) and as evidenced by Hawkins et al (US 5201987) as applied to claim 1 and further in view of Maracas et al (US 5937758).

Whitesides et al (US 5900160) as modified by Biebuyck et al (US 5817242) disclose a micro contact-printing stamp but do not expressly disclose feature size to be less than 1 μm .

Maracas et al disclose a stamp with micron /sub micron feature size (Col 3 line 22-25 and Col 8 line 17-18).

As feature size in integrated circuits is being required to be more and more narrower, it would have been obvious for one of ordinary skill in the art at the time invention was made to make the stamp of Hawker with sub micron feature size to be able to pattern sub micron features.

4. Claims 6 and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Whitesides et al (US 5900160) in view of Biebuyck et al (US 5817242).

Whitesides et al disclose a method of manufacturing a stamp for use in a lithographic process (Fig 8a-9f Col 14 line 28 to Col 15 line 19) which includes anisotropic etching of a surface, to produce a recess which becomes narrower as its distance to the original surface increases (Fig 8d and Col 15 line 10-19), its projection always lying in the aperture and making a replica of the patterned mold surface (Fig 9d-e and Col 14 lines 65-66).

Whitesides et al do not expressly disclose recesses of different apertures. However the method of manufacturing a stamp of different apertures would be to use masking of different apertures. The disclosed method of anisotropic etching will make a triangular etch of deeper proportion for larger area exposed to etch compared to a smaller area. Whitesides et al do not also disclose an unmolding agent between the mold and first body.

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Biebuyck et al (Fig 2D) disclose an unmolding agent perfluorinated silane (Fig 2A –21 and Col 4 lines 7-9).

Therefore it would have been obvious to one of ordinary skill in the art at the time invention was made to have a stamp with varying recesses to micro print features of varying dimensions.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Whitesides et al (US 5900160) in view of Biebuyck et al (US 5817242) as applied to claim 6 and further in view of Whitesides et al (Article Soft lithography Angew. Chem. Int. Ed. 1998, vol. 37 pages 551-575).

White sides et al disclose replica from a master as in claim 6 but do not disclose expressly that a replica could be made of a stamp body.

However Whitesides et al in their article (page 562- 4.1 A) show that method of making replica of a rigid mold as well as an elastomer mold had been demonstrated at nanometer scale.

Therefore making a replica of stamp body of claim 6 would have been obvious to one of ordinary skill in the art at the time invention was made so as to be able to pattern with the same polarity as the original stamp.

6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Whitesides et al (US 5900160) in view of Biebuyck et al (US 5817242) as applied to claim 13 and further in view of Choquette et al (US 6245412).

Biebuyck et al disclose application of fluorinated silane for separation layer but do not disclose that the layer could be deposited in vacuum like vapor deposition.

Choquette et al disclose use of fluorinated silane for separation layer and disclose that methods for this by vapor deposition were well known (Col 4 lines 6-9).

Therefore it would have been obvious for one of ordinary skill in the art at the time of invention to have separation layer of fluorinated silane vacuum deposited for uniformity of thickness.

(10) *Response to Argument*

Re: Ground A referring to rejection of claims 1-2 and 5

Applicant argues that Whitesides et al ('160) is directed to creating a stamping surface having a pattern of closely spaced features and this closely-spaced relationship would be destroyed by providing larger apertures. Applicant directs attention to Col 7 lines 10-18.

It is noted that the citation reads "The stamping pattern includes closely spaced features". It does not exclude larger spaced features. Moreover terms like "closely spaced" or "largely spaced" are only relative. There is nothing in the reference to infer that larger features of the claim are excluded.

Applicant further argues that the Examiner fails to present evidence that the skilled artisan would use the cited etch techniques from the Hawkins et al (US 5201987).

It is noted that Claim 1 is an apparatus claim and Hawkins et al is used to show that typically a larger aperture would result in a deeper etch compared to a smaller aperture.

Applicants comment about etch techniques are not relevant in this context.

Re: Ground B referring to rejection of claim 3

Applicant argues that '160 reference acknowledges deformation of a stamp which prevents spacing of aperture within one micron.

At Col 10 lines 6-15 Whitesides et al state that the compressive force would deform and reduce feature size. This does not mean that sub micron features may not be obtainable. It is noted that sub micron feature size is obtained by design and not by using the stamp at high compressive force thereby to deform the stamp.

Re: Ground C referring to rejection of claims 6 and 11-13

Applicant argues that the Examiner fails to identify where replica contains structures of different sizes.

This rejection relies on the fact that different sized apertures could be obtained by using mask with different size apertures. The claim does not require larger depth for larger aperture. Even though typically that is what would happen as taught by Hawkins et al.

Applicant argues that the reference ' 242 could not be applied for rejecting both claims 11 and 12.

Since unmolding (separating) agent helps to separate the mold from the first body it could obviously applied to any of the separating surfaces.

Re: Ground D referring to rejection of claim 7.

Applicant argues that the Examiner fails to present a reference that teaches "a replica is made of the patterned surface of the first body in a second body which has a patterned surface.

Since replica could be made from first body to second body or even further the method of making replica reads on the claim.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

R AV 1763

Ram Kackar
June 13, 2005

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